

**State of Wisconsin/Department of Transportation**  
RESEARCH PROGRESS REPORT FOR THE QUARTER ENDING: June 3, 2008

Program: SPR-0010(36) FFY99		Part: II Research and Development	
<b>Project Title:</b> Effective Depth of Soil Compaction in Relation to Applied Compactive Energy		<b>Project ID:</b> 0092-08-11	
<b>Administrative Contact:</b> Andrew Hanz		<b>Sponsor:</b> WHRP	
<b>WisDOT Technical Contact:</b> Bob Arndorfer		<b>Approved Starting Date:</b> 10/7/07	
<b>Approved by COR/Steering Committee:</b> \$54,914		<b>Original End Date:</b> 4/7/07	
<b>Project Investigator (agency &amp; contact):</b> Dante Fratta & Haifang Wen- University of Wisconsin-Madison		<b>Current End Date:</b> 4/7/09	
		<b>Number of Extensions:</b> 0	

**Percent Complete:** 35%

**Request a No Cost Time Extension (Please Select One):** ☐ YES ☒ NO

**Reason for No Cost Time Extension:** None

**Project Description:**

The determination of the appropriate lift thicknesses used in embankment construction operations has important economic and engineering implications in the design and construction of roads, levees and dams. For example, small lift thicknesses may cause excessive construction costs while large lift thicknesses may reduce the compaction effectiveness and compromise the integrity of the embankment. This research proposal will use experimental results and numerical analyses to evaluate the effective depth of compaction. These results and analyses will provide the engineering understanding of the problem and justify recommendations about maximum lift thickness to be used in WisDOT embankment construction projects.

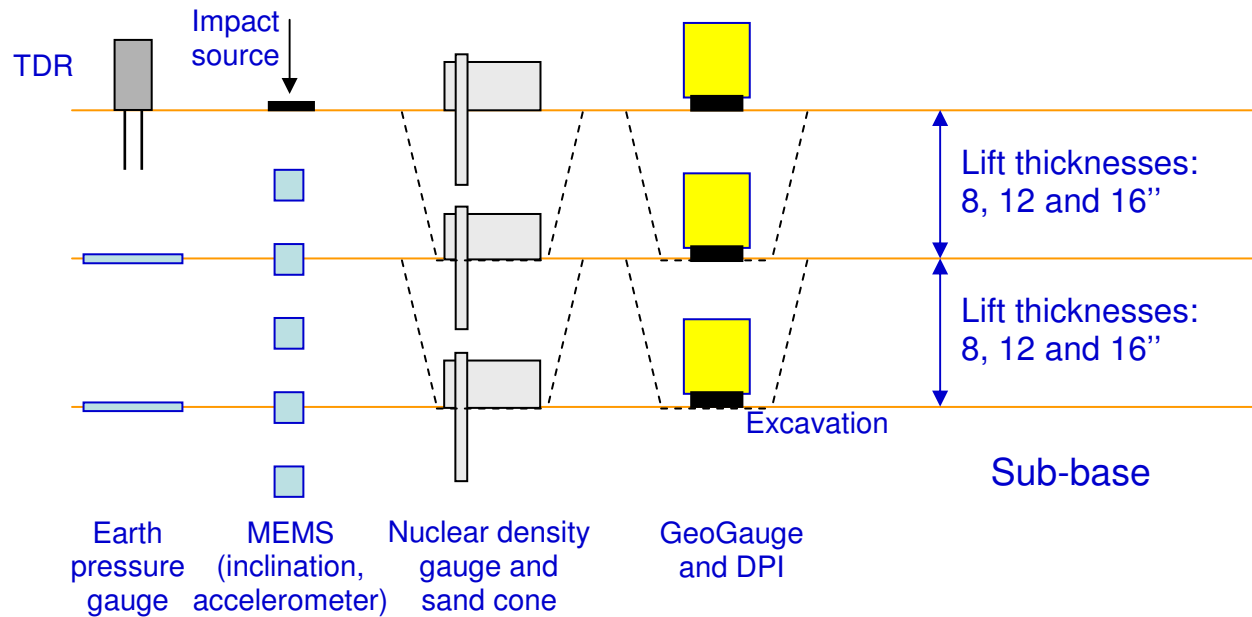
This proposed research program will collect data and develop analyses needed to determine optimum lift thickness for WisDOT embankment construction projects. The results will establish a relationship between the applied compaction energy and the level of compaction achieved at increasing depths for a number of different soils and moisture contents. The data, analyses, and correlations will help WisDOT officials in proposing possible revisions to current constructions specifications including the need to change the established 8-in lift thickness in the construction of compacted embankments. The successful completion of this research will also help WisDOT officials in improving construction operations by creating more stable and economical subgrade structures.

**Progress This Quarter:**

During the third quarter, the research team focused its attention on the characterization of materials and the preparation for the instrumentation for field testing. The research team developed a field instrumentation plan that was presented to the Geotechnics TOC members (Bob Arndorfer and Jeff Horsefall) in a Mar. 26, 2008 meeting at the DOT offices. This plan was

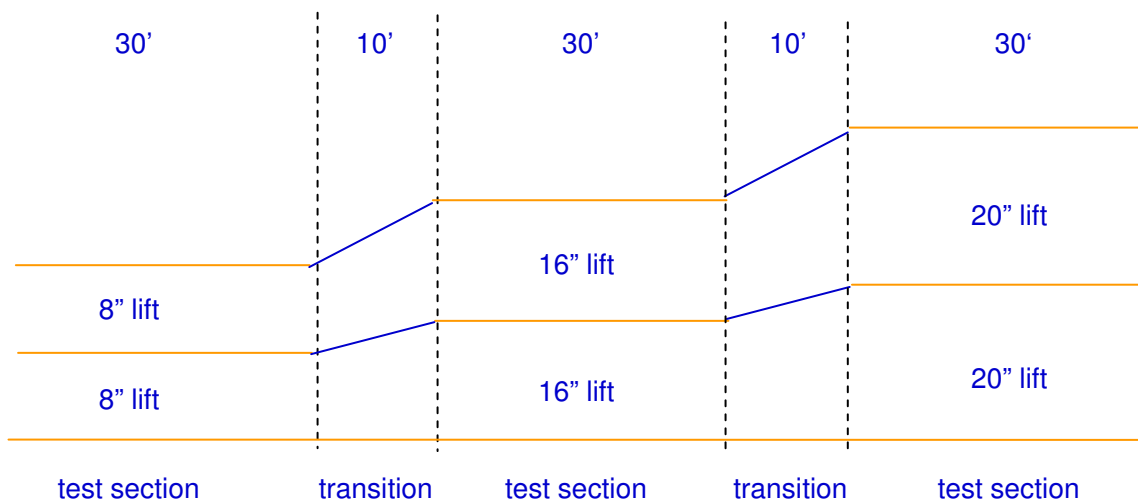
presented and agreed with Hoffman Construction Co. officials (April 2008 meeting). The proposed set of measurements follows:

### Field Testing Instrumentation



Note: due to logistical problems, the research team will not run nuclear density gauges and will only test the density using sand cone test.

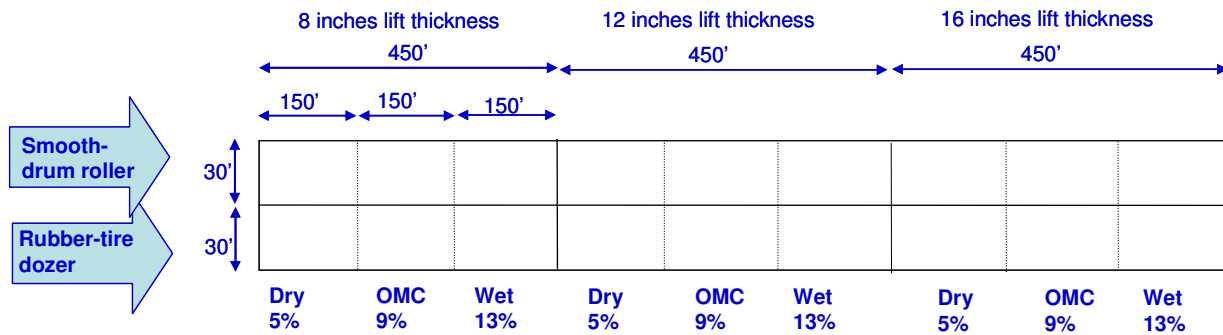
### Field Testing operation



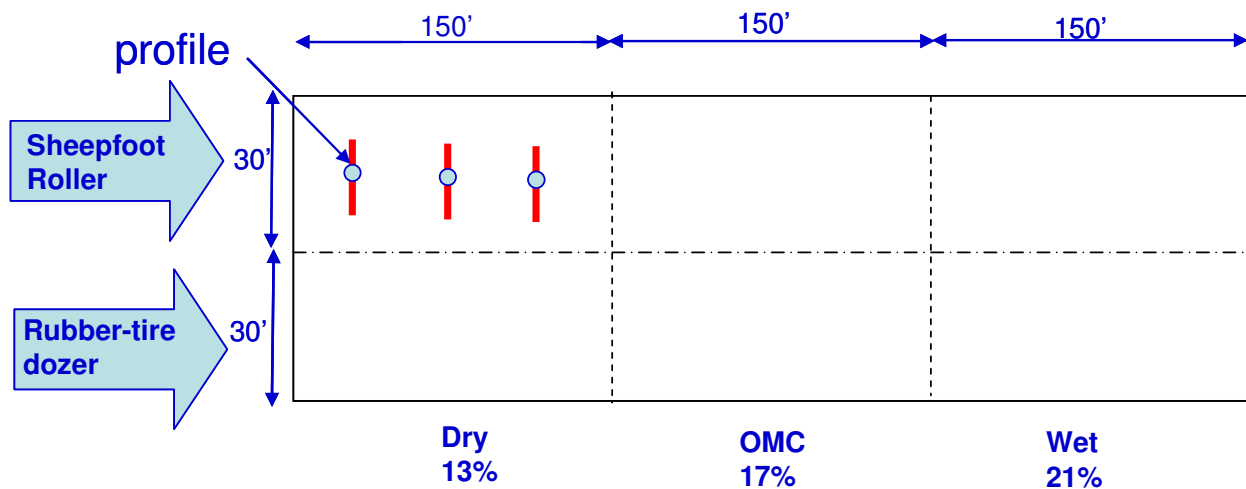
Each section is 15' wide

Sub-base: made of the material as the compacted lifts

Sandy soil (coarse grained soil - optimal water content: 9%)



Silty soil (fine grained soil - optimal water content: 9%)



The Geotechnic TOC members and Hoffmann Construction Company agreed to the following testing matrix:

1 - 6 passes			
Fine-grained Soil		Coarse-grained Soil	
Sheepsfoot Roller	Rubber-tired Roller	Smooth-drum Vibratory Roller	Rubber-tired Roller
Dry (1-3%<wop): 8, 12, and 16" lifts	Dry (4-5%<wop): 8, 12, and 16" lifts	Dry (4-5%<wop): 8, 12, and 16" lifts	Dry (4-5%<wop): 8, 12, and 16" lifts
Optimum: 8, 12, and 16" lifts	Optimum: 8, 12, and 16" lifts	Optimum: 8, 12, and 16" lifts	Optimum: 8, 12, and 16" lifts
Wet (1-3%>wop): 8, 12, and 16" lifts	Wet (4-5%>wop): 8, 12, and 16" lifts	Wet (4-5%>wop): 8, 12, and 16" lifts	Wet (4-5%>wop): 8, 12, and 16" lifts

Previous to the field testing, the research team collected representative soils and performed soil classifications and compaction tests. These data will be used in the determination of field compaction parameters.

**Work Next Quarter:**

During the fourth quarter the research team will complete field data collection (week of July 7 2008) and will begin data reduction and interpretation. The research team will complement the interpretation of the data with numerical modeling and analysis to evaluate appropriate lift thicknesses used in embankment construction operations.

**Circumstances Affecting Progress/Budget:**

None

**Gantt Chart:**

Phase Number	1.5 Years (18 months)					
	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Quarter 5	Quarter 6
Phase I						
Phase II						
Phase III						
Phase IV						
Phase V						